NURSERY AUTOMATION AND MONITORING USING IOT

Group Project Report

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(AUTONOMOUS)

CERTIFICATE

This is to certify that the Group Project work entitled "**NURSERY AUTOMATION AND MONITORING USING IOT**", submitted by **T.ROHIT (19311A1957), K.Lakshana (19311A1958)** towards partial fulfillment for the award of Bachelor's Degree in Electronics & Computer Engineering from Sreenidhi Institute of Science & Technology, Ghatkesar, Hyderabad, is a record of bonafide work done by them. The results embodied in the work are not submitted to any other University or Institute for an award of any degree or diploma.

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ABSTRACT

IoT is an emerging technology in recent years. Using IoT, it is easy to build the application which makes human's life easier. It decreases the efforts of human physically and give the pin-point values. Now-a-days, we see IoT in every domain. One of the domains is nursery where the plants are maintained in various weather conditions. The main objective of this paper is to develop an automated model which can also be monitored for the good growth of the plants in a nursery. Since various tiny plants are grown in a nursery, it is very important to monitor and maintain a good weather conditions which plays a key role. The parameters like humidity, temperature, and soil moisture are taken to monitor the plants. Whenever the temperature values are high, a fan is activated to maintain the temperature so that the plants will grow healthy. This model is developed using Arduino AT Mega 328, ESP 8266 Wi-Fi module, and sensors like humidity, temperature, and soil moisture. The values predicted by these sensors can be viewed on a Free application.

CONTENTS

CHAPTER 1

INTRODUCTION

In a nursery, plants are grown with the optimal temperatures to ensure the germination and also to save the time to raise the next crop. It is very important to condition the plants so that they will grow healthy. Nursery is maintained manually which requires human efforts. We also see many commercial nurseries which requires more attention to monitor them and there might be a chance where a human can go wrong which effects the plants evasively. To overcome this, IoT can be a solution to maintain a nursery considering all the environmental parameters like humidity, temperature, and moisture where the values get updated on an application to view. An optimal temperature where it is sufficient to plants is set and when the temperature exceeds the temperature which is set, a fan is activated automatically which ensures to keep the temperatures in optimum. This is done by the Arduino. When the temperature is higher than the optimal temperature, the Arduino sends the signals to activate the fan. For instance, if the plants in the nursery can bare up to 35 degree Celsius and if the temperature is 40 degree Celsius then the Arduino gives the signal to activate the fan. Hence the fan rotates and makes the temperature to be in optimum.

A. Motivation: The majority of the cultivating in nursery vegetation or regularly cultivating in India, which ordinarily doesn't deliver the adequate measure of benefit for environment in our surroundings and also to maintain the plants in a good condition. This is the principle motivation behind why huge no. of agriculturists are conferring loss now-a-days and furthermore, they wind up unfit to run a nursery where they find it too hard to maintain. Just because of this reason people are showing less interest towards such processes to maintain.

B. Objective & Findings: Our main objective over here is to build a low cost automated and monitoring system for maintaining a nursery, which can be afforded by all groups of interested people and also farmers in India. This proposed design of automated and monitoring IoT technology for cultivation can be one of the best alternatives to help in

changing its practices to cultivation of plants by this new innovation. This proposed model will cost less and varies depending upon the size of the area covered in the cultivation process which will be at nominal cost. So, now it's the time to make people aware of technology-based farming procedures which can make easy in monitoring and maintaining and help the farmers.

The rest of the paper is organized as follows: first we introduce the concept of Internet of Things (IoT), in the field of science and technology and describe the models, i.e., the connection of end users, devices to the Internet and the cloud, in Section 2. In the next section literature survey is discussed. Section 4 describe about Automated and Monitoring Technology with all the sensors associated with it as well as controlling systems and estimated the cultivation cost of expenditure considering the cash crop as Saffron at the end of this part. Section 5 describes some of the advantages of the cultivation of cash crops in India. In Section 6, the references are mentioned.

IOT IN NURSERY.

IoT is one the best methods in these days to make a take even more simple where many hardware components connect through a network and can be controlled using a device from any distant place. The data collected by the hardware devices can be seen on the cloud or any other desired application. In it although the machine-to-machine technology is that the 1st section, however it allows new applications and to bridge numerous technologies by connecting physical objects along in support of intelligent decisions [5]. Here, in our planned model we've got used the subsequent hardware devices for the dominant unit of nursery includes a microcontroller, Arduino, sensors, actuators and connecting cables wherever all the sensors and actuators area unit connected to the microcontroller so the microcontroller is connected to the Arduino in order that we are able to get the important time information on our customized pc at that instant The main plan behind the model is however the physical devices area unit simply accessible by the sensor network supplier to gather the sensory information. These sensory information helps in storage and processing and communicated to the cloud by the cloud service supplier. The cloud stores and processes that information and delivered to the user's service demand applications. These device network supplier's area unit act because the information sources for inexperienced cloud computing [6].

IOT TECHNIQUES IN AGRICULTURE

Agricultural method will be classified into 3 classes, particularly farm observation, automatic irrigation:

Farm observance

In farm observance, totally different devices ar accustomed monitor the varied environmental conditions and also the discovered details is accessed from a distant place. The farmers will monitor, analyse and management devices from a distant platform.

Automatic Irrigation System

On automatic irrigation system, supported the environmental acquisition system, mechanically irrigates the sector, that saves farmer's time, efforts and heap of water wastage. Pota mitis et. al [7] projected sensible traps, that helps farmers to observe agricultural land from foreign places against insects. the fundamental mechanism is wise lure, that encompasses a lightweight electrode and a light-weight receiver device, facing one another. Whenever Associate in Nursing insect crosses this setup, it disturbs lightweight and voltage and gets at bay. this fashion the numbers of insects coming into are counted. numerous sort traps ar designed to discover totally different insects, system will count insects that ar larger than 6mm. The insect count is transferred to the server victimization GPRS mode, that utilizes TCP/IP and HTTP protocol. The information's are hold on in MYSQL server and data is accessed by PHP scripting language.

1.1 EMBEDDED SYSTEMS:

Associate in Nursing embedded system could be a ADPS designed to perform one or some dedicated functions typically with period of time computing constraints. It's embedded as a section of a whole device generally in conjunction with hardware and mechanical parts. in distinction, a general-purpose laptop, sort of a personal laptop (PC), is supposed to be versatile and to meet an honest vary of end-user needs. Embedded systems management many devices in common use these days.

Embedded systems unit of measurement controlled by one or loads of main method cores that unit of measurement sometimes either microcontrollers or digital signal processors

(DSP). The key characteristic, however, is being dedicated to handle a particular task, which may want very powerful processors. for example, traffic management systems might usefully be viewed as embedded, though they involve mainframe computers and dedicated regional and national networks between airports and measuring system sites. (Each measuring system presumably includes one or loads of embedded systems of its own). Since the embedded system is dedicated to specific tasks, vogue engineers can optimize it to chop back the size and value of the merchandise and increase the responsibility and performance. Some embedded systems unit of measurement ready-made, cashing in on economies of scale. Physically embedded systems vary from transferable devices like digital watches and MP3 players, to huge stationary installations like traffic lights, manufacturing plant controllers, or the systems dominant nuclear energy plants. quality varies from low, with one microcontroller chip, to very high with multiple units, peripherals Associate in Nursing networks mounted inside an oversize chassis or enclosure. In general, "embedded system" is not a strictly judicable term, as most systems have some part of extensibility or programmability. for example, hand-held computers share some components with embedded systems just like the operative systems and microprocessors that power them, but they enable wholly completely different applications to be loaded and peripherals to be connected. Moreover, even systems that don't expose programmability as a primary feature sometimes have to be compelled to support software system package updates. On a time from "general purpose" to "embedded", huge application systems will have subcomponents at the foremost points still the system as a whole is "designed to perform one or several dedicated functions", and is so acceptable to call "embedded". a recent example of embedded system is shown in fig.1.1.

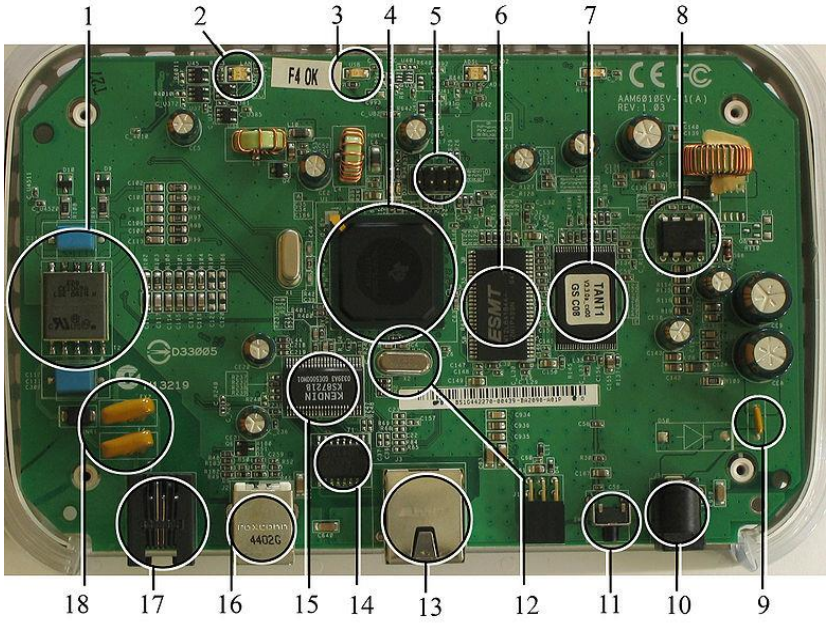


Fig 1.1: Embedded system example

Labelled components embody microchip (4), RAM (6), non-volatile storage (7). Embedded systems programming isn't like traditional computer programming. In many ways, programming for Associate in Nursing embedded system is like programming computer fifteen years past. The hardware for the system is typically chosen to form the device as low cost as doable. defrayment an additional greenback a unit so as to form things easier to program will price millions. Hiring a computer user for an additional month is affordable as compared. this implies the computer user should contend with slow processors and low memory, whereas at a similar time battling a desire for potency not seen in most computer applications. Below could be a list of problems specific to the embedded field.

1.1.1 HISTORY:

In the earliest years of computers within the 1930–40s, computers were typically dedicated to one task, however were way overlarge and big-ticket for many styles of tasks performed by embedded computers of nowadays. Over time but, the thought of programmable controllers evolved from ancient mechanical device sequencers, via solid state devices, to the utilization of technology. One of the primary recognizably fashionable embedded systems was the Phoebus steerage laptop, developed by Charles Stark bargained at the MIT Instrumentation Laboratory. At the project's origin, the

{apollo|Apollo|Phoebus|Phoebus Phoebus|Greek deity} steerage laptop was thought-about the riskiest item within the Apollo project because it used the then fresh developed monolithic integrated circuits to cut back the scale and weight. Associate in Nursing early factory-made embedded system was the Autonetics D-17 steerage laptop for the Minuteman missile, discharged in 1961. it absolutely was engineered from semiconductor device logic and had a tough disk for main memory. once the Minuteman II went into production in 1966, the D-17 was replaced with a replacement laptop that was the primary high-volume use of integrated circuits.

1.1.2 TOOLS:

Embedded development makes up a tiny low fraction of total programming. there is conjointly an outsized variety of embedded architectures, in contrast to the computer world wherever one instruction set rules, and also the UNIX operating system world wherever there are solely three or four major ones. this implies that the tools area unit costlier. It conjointly implies that they are lower featured, and fewer developed. On a significant embedded project, at some purpose you may nearly always notice a compiler bug of some type. Debugging tools area unit another issue. Since you cannot continually run general programs on your embedded processor, you cannot continually run a computer program thereon. This makes fixing your program tough. Special hardware like JTAG ports will overcome this issue partly. However, if you stop on a breakpoint once your system is dominant planet hardware (such as a motor), permanent instrumentation injury will occur. As a result, folks doing embedded programming quickly become masters at mistreatment serial IO channels and error message vogue debugging.

1.1.3 RESOURCES:

To avoid wasting prices, embedded systems oftentimes have the most affordable processors that may do the task. this implies your programs have to be compelled to be written as expeditiously as doable. once handling giant information sets, problems like buffer misses that ne'er matter in computer programming will hurt you. Luckily, this would possibly not happen too often- use moderately economical algorithms to begin, and optimize only if necessary. Of course, traditional profilers will not work well, because of a similar reason debugger do not work well. Memory is additionally a difficulty. For a

similar price savings reasons, embedded systems typically have the smallest amount memory they will go away with. meaning their algorithms should be memory economical (unlike in computer programs, you may oftentimes sacrifice processor time for memory, instead of the reverse). It conjointly means that you cannot afford to leak memory. Embedded applications usually use settled memory techniques and avoid the default "new" and "malloc" functions, in order that leaks are often found and eliminated a lot of simply. alternative resources programmers expect might not even exist. for instance, most embedded processors don't have hardware FPUs (Floating-Point process Unit). These resources either have to be compelled to be emulated in software system, or avoided altogether.

1.1.4 REAL TIME ISSUES:

Embedded systems oftentimes management hardware, and should be ready to reply to them in real time. Failure to try to therefore might cause quality in measurements, or perhaps injury hardware like motors. this can be created even harder by the dearth of resources obtainable. the majority embedded systems have to be compelled to be ready to order some tasks over others, and to be ready to place off/skip low priority tasks like UI in favour of high priority tasks like hardware management.

1.2 USE FOR EMBEDDED SYSTEMS:

The uses of embedded systems area unit just about limitless, as a result of a day new merchandise area unit introduced to the market that utilizes embedded computers in novel ways that. In recent years, hardware like microprocessors, microcontrollers, and FPGA chips became less expensive. therefore, once implementing a replacement kind of management, it's wiser to merely obtain the generic chip and write your own custom software system for it. manufacturing a custom-built chip to handle a selected task or set of tasks prices much more time and cash. several embedded computers even go along with in depth libraries, in order that "writing your own software" becomes a awfully trivial task so. From Associate in Nursing implementation viewpoint, there's a significant distinction between a laptop Associate in Nursing an embedded system. Embedded systems area unit usually needed to supply time period response. the most components that build embedded systems distinctive area unit its responsibleness and ease in debugging.

1.2.1 DEBUGGING:

Embedded debugging is also performed at totally different levels, looking on the facilities on the market. From simplest to most sophisticate, they'll be roughly classified into the subsequent areas:

- Interactive resident debugging, victimization the straightforward shell provided by the embedded software system (e.g., Forth and Basic)
- External righting victimization work or interface output to trace operation victimization either a monitor in flash or employing a debug server just like the Remedy computer program that even works for heterogeneous multi core systems.
- An in-circuit computer program (ICD), a hardware device that connects to the microchip via a JTAG or Nexus interface. this permits the operation of the microchip to be controlled outwardly, however is usually restricted to specific debugging capabilities within the processor.
- An in-circuit individual replaces the microchip with a simulated equivalent, providing full management over all aspects of the microchip.
- A complete individual provides a simulation of all aspects of the hardware, permitting all of it to be controlled and changed and permitting debugging on a standard computer.
- Unless restricted to external debugging, the computer programmer will generally load and run code through the tools, read the code running within the processor, and begin or stop its operation. The read of the code is also as assembly code or source-code.

As a result of AN embedded system is commonly composed of a large form of parts, the debugging strategy could vary. as an example, debugging a software (and microprocessor) central embedded system is totally different from debugging AN embedded system wherever most of the process is performed by peripherals (DSP, FPGA, co-processor). AN increasing variety of embedded systems these days use over one single processor core. a typical downside with multi-core development is that the correct synchronization of code execution. In such a case, the embedded system style may need to examine the info traffic on the busses between the processor cores, which needs terribly low-level debugging, at signal/bus level, with a logic analyser, as an example.

1.2.2 RELIABILITY:

Embedded systems usually reside in machines that area unit expected to run unendingly for years while not errors and in some cases recover by themselves if a mistake happens. thus, the code is sometimes developed and tested additional rigorously than that for private computers, and unreliable mechanical moving components like disk drives, switches or buttons area unit avoided.

Specific responsibility problems could include:

- The system cannot safely be clean up for repair, or it's too inaccessible to repair. Examples embody house systems, subsurface cables, guidance beacons, hole in the ground systems, and cars.
- The system should be unbroken running for safety reasons. "Limp modes" area unit less tolerable. usually, backups area unit designated by AN operator. Examples embody craft navigation, reactor management systems, safety-critical chemical manufactory controls, train signals, engines on single-engine craft.
- The system can lose massive amounts of cash once shut down: phone switches, manufactory controls, bridge and elevator controls, funds transfer and market creating, machine-controlled sales and repair.

A variety of techniques area unit used, typically together, to live through errors—both code bugs like memory leaks, and conjointly soft errors within the hardware:

- Watchdog timer that resets the pc unless the code sporadically notifies the watchdog
- Subsystems with redundant spares which will be move to
- software "limp modes" that offer partial operate
- Designing with a sure Computing Base (TCB) architecture [6] ensures a extremely secure & reliable system setting
- An Embedded Hypervisor is in a position to produce secure encapsulation for any scheme element, so a compromised code element cannot interfere with different subsystems, or privileged-level system code. This encapsulation keeps faults from propagating from one scheme to a different, rising responsibility. this might conjointly enable a scheme to be mechanically clean up and restarted on fault detection.
- Immunity Aware Programming

1.3 CLARIFICATION OF EMBEDDED SYSTEMS

1.3.1 CODE ARCHITECTURE:

There are a unit many differing types of code design in common use.

- **Simple management Loop:**

During this style, the code merely features a loop. The loop calls subroutines, every of that manages a neighbourhood of the hardware or code.

Interrupt Controlled System:

Some embedded systems unit preponderantly interrupting controlled. this implies that tasks performed by the system unit triggered by completely different types of events. associate interrupt is also generated as Associate in Nursing example by a timer throughout a predefined frequency, or by an interface controller receiving a storage unit. These sorts of systems unit used if event handlers would like low latency and in addition the event handler's unit short and easy.

Generally, these sorts of systems run an easy task throughout a main loop besides, however this task isn't terribly sensitive to gorgeous delays. typically, the interrupt handler can add longer tasks to a queue structure. Later, once the interrupt handler has finished, these tasks unit dead by the foremost loop. this methodology brings the system on the aim of a multitasking kernel with separate processes.

- **Cooperative Multitasking:**

A non-pre-emptive multitasking system is extremely nearly a bit like the simple management loop theme, except that the loop is hidden in associate API. the computer user defines a series of tasks, and every task gets its own surroundings to "run" in. once a task is idle, it calls associate idle routine, generally spoken as "pause", "wait", "yield", "nop" (stands for no operation), etc. The advantages and downsides unit terribly nearly a bit like the management loop, except that adding new package may be a smaller quantity subtle, by merely writing a recent task, or adding to the queue-interpreter.

- **Primitive Multitasking:**

Throughout this sort of system, a low-level piece of code switches between tasks or threads supported a timer (connected to associate interrupt). this may be the amount at that the system is typically thought-about to possess associate "operating system" kernel.

looking forward to what quantity utility is needed, it introduces further or less of the complexities of managing multiple tasks running conceptually in parallel.

As associate code will all told chance hurt the information of Associate in Nursing other task (except in larger systems exploitation AN MMU) programs have to be compelled to be strictly designed and tested, and access to shared data have to be compelled to be controlled by some synchronization strategy, like message queues, semaphores or a non-blocking synchronization theme.

Attributable to these complexities, it's traditional for organizations to shop for an amount package, permitting the applying programmers to trust device utility instead of package services, a minimum of for big systems; smaller systems generally cannot afford the overhead related to a generic real time system, attributable to limitations regarding memory size, performance, and/or battery life.

- **Microkernels and Exokernels:**

A microkernel might even be a logical maximize from a amount OS. the same previous arrangement is that the package kernel allocates memory and switches the hardware to completely all completely different threads of execution. User mode processes implement major functions like file systems, network interfaces, etc.

In general, microkernels succeed once the task switch and inter-task communication is quick, and fail once they unit slow. Exokernels communicate expeditiously by ancient package calls. The hardware and every one the package among the system unit offered to, and protractible by application programmers. supported performance, usefulness, demand the embedded systems unit divided into 3 classes.

1.3.2 STAND ALONE EMBEDDED SYSTEM:

These systems take the input among the sort of electrical signals from transducers or commands from kinsmen like pressing of a button etc.., methodology them and produces desired output. this whole methodology of taking input, methodology it and giving output is finished in standalone mode. Such embedded systems come at a lower place standalone embedded system

Eg: microwave, cooling system etc.

1.3.3 AMOUNT EMBEDDED SYSTEMS:

Embedded systems that unit accustomed perform a particular task or operation throughout a selected amount those systems unit spoken as as amount embedded systems. There unit 2 varieties of amount embedded systems.

- **Hard amount embedded systems:**

These embedded systems follow associate absolute dead line amount i.e.., if the tasking isn't exhausted a selected amount, then there's a reason for hurt to the complete instrumentality.

Eg: take into account a system during which we've got to open a valve at intervals thirty milliseconds. If this valve isn't opened in thirty ms this might cause injury to the whole instrumentation. thus, in such cases we have a tendency to use embedded systems for doing automatic operations.

- **Soft Real Time embedded systems:**

These embedded systems follow a relative dead line fundamental measure i.e.., if the task isn't drained a selected time that may not cause injury to the instrumentation.

Eg: take into account a TV remote system, if the remote takes many milliseconds delay it'll not cause injury either to the TV or to the remote. These systems which is able to not cause injury once they don't seem to be operated at appreciable fundamental measure those systems come underneath soft time period embedded systems.

1.3.4 NETWORK COMMUNICATION EMBEDDED SYSTEMS:

A large vary network interfacing communication is provided by victimization embedded systems. Eg:

- Consider an {internet an online} camera that's connected to the pc with internet are often accustomed unfold communication like causation photos, images, videos etc.., to a different pc with net association throughout anyplace within the world.
- Consider an internet camera that's connected at the door lock.

Whenever someone comes close to the door, it captures the image of someone and sends to the desktop of your pc that is connected to net. this offers Associate in Nursing

alerting message with image on to the desktop of your pc, so you'll open the door lock simply by clicking the mouse.

Fig 1.2: Network communication embedded systems

1.3.5 DIFFERINT KINDS OF PROCESS UNITS:

The central process unit (c.p.u) are often anybody of the subsequent microchip, microcontroller, digital signal process.

- Among these Microcontroller is of low value processor and one amongst the most advantage of microcontrollers is, the elements like memory, serial communication interfaces, analog to digital converters etc.., of these ar designed on one chip. The numbers of external elements that ar connected thereto ar terribly less in step with the applying.
- Microprocessors ar additional powerful than microcontrollers. they're utilized in major applications with variety of tasking necessities. however, the microchip needs several external elements like memory, serial communication, hard disk, input output ports etc.., therefore the power consumption is additionally terribly high compared to microcontrollers.
- Digital signal process is employed primarily for the applications that notably committed process of signals.

1.4 APPLICATIONS OF EMBEDDED SYSTEMS

1.4.1 SHOPPER APPLICATIONS:

We have a tendency to use variety of embedded systems that embody microwave, remote, vcd players, optical disc players, camera etc….

Fig1.3: Automatic coffee maker equipment

1.4.2 OFFICE AUTOMATION:

We even have systems like fax machine, modem, printer etc which are used in our daily life.

Fig1.4: Fax machine

Fig1.5: Printing machine

1.4.3 INDUSTRIAL AUTOMATION:

Today plenty of industries use exploitation embedded systems for method management. In industries we have a tendency to style the embedded systems to perform a selected operation like observance temperature, pressure, humidity, voltage, current etc.., and basing on these monitored levels we have a tendency to do management different devices, we are able to send data to a centralized observance station.

Fig1.6: Robot

In essential industries wherever human presence is avoided there we will able to use robots that are programmed to try to a selected operation.

1.4.4 COMPUTER NETWORKING:

Embedded systems can also be used as bridge routers etc.

Fig1.7: Computer networking

1.4.5 TELE COMMUNICATIONS:

In our daily lives we use many gadgets like cell phone etc.

Chapter 2

Proposed System

AUTOMATED AND MONITORING NURSERY TECHNOLOGY:

As shown in Figure. 1, the Arduino has sensors like humidity, temperature, soil moisture, light and also a fan and Wi-Fi module. The humidity sensor is used to sense the moisture or the vapour in the air and the values are displayed. The temperature sensor senses the temperature in the nursery and displays the values. In the Arduino, an optimum temperature is set. When the temperature is more than the value which has been set, the Arduino gives the signals to activate the fan and thus the temperature in nursery will be normal and the plants will not be harmed. The soil moisture sensor is used to sense the moisture content in the soil. When the soil is dry, the Arduino gives the signal to the motor and thus the water is released to the plants and they can grow healthy.

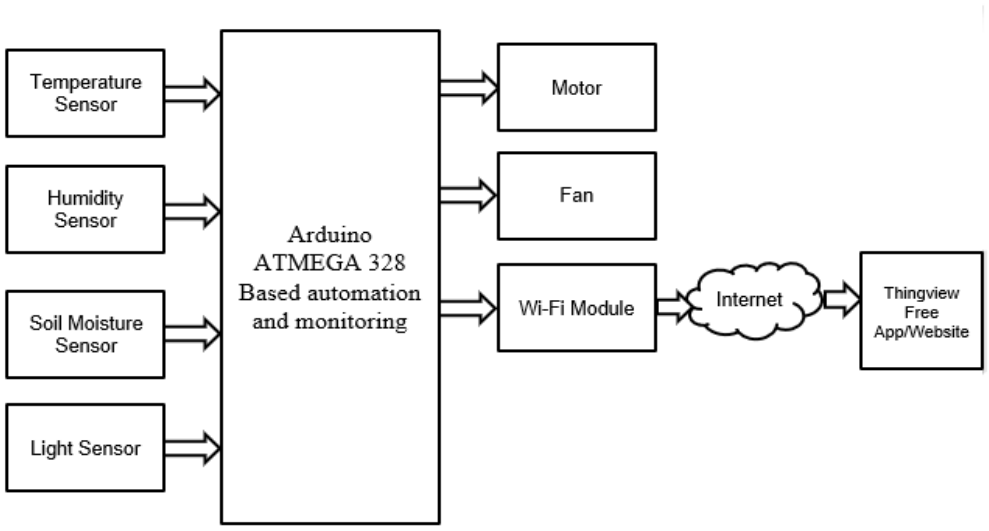


Fig. 3.1: Block diagram

The Light sensor is activated when the sunlight is low in the surroundings and it is a sensitive sensor. As the light increases, the sensor's light becomes bright and when the light is low, the sensor's light decreases. The Wi-Fi module is used to establish the connection for the user and the Arduino. The network name and password must satisfy the inbuilt Arduino network name including the password to establish the connection. If the network credentials are not the same, the connection will be failed.

This is for the security concern where the data cannot be viewed by the other persons. The data can be viewed on an application and also a website named Thing View Free. The application and website do not cost any amount and to view the data predicted by the sensors, credentials must be entered on the website or the application. To keep the data safe, there is an option to disable the public option. Enabling this the data will be in private and can only be accessed and viewed by the user.

3.1 UML DIAGRAMS:

A graphical tool wants to describe and analyse the instant of information through a system manual or automatic as well as the method, stores of information, and delays within the system. knowledge Flow Diagrams square measure the central tool and also the basis from that alternative parts square measure developed. The transformation of information from input to output, through processes, is also delineated logically and severally of the physical parts related to the system. The DFD is additionally grasp as an information flow graph or a bubble chart.

DFDs square measure the model of the planned system. They clearly ought to show the wants on that the new system ought to be engineered. Later throughout style activity this is often taken because the basis for drawing the system's structure charts. the essential Notation want to produce a DFD's square measure as follows:

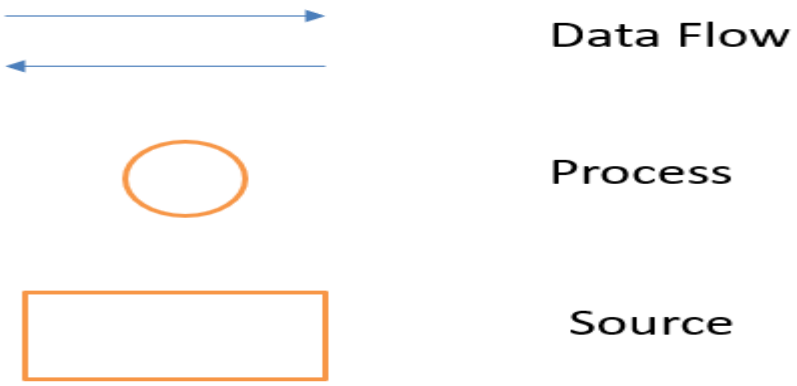


Fig.3.2: Uml diagrams

3.1.1 USE CASE DIAGRAM:

A UML use case diagram is that the primary type of system/software necessities for a brand-new computer code program underdeveloped. Use cases specify the expected behaviour (what), and not the precise methodology of creating it happen (how). Use cases

once such that are often denoted each matter and visual illustration (i.e., use case diagram). A key thought of United States of America case modelling is that it helps us style a system from the top user's perspective.

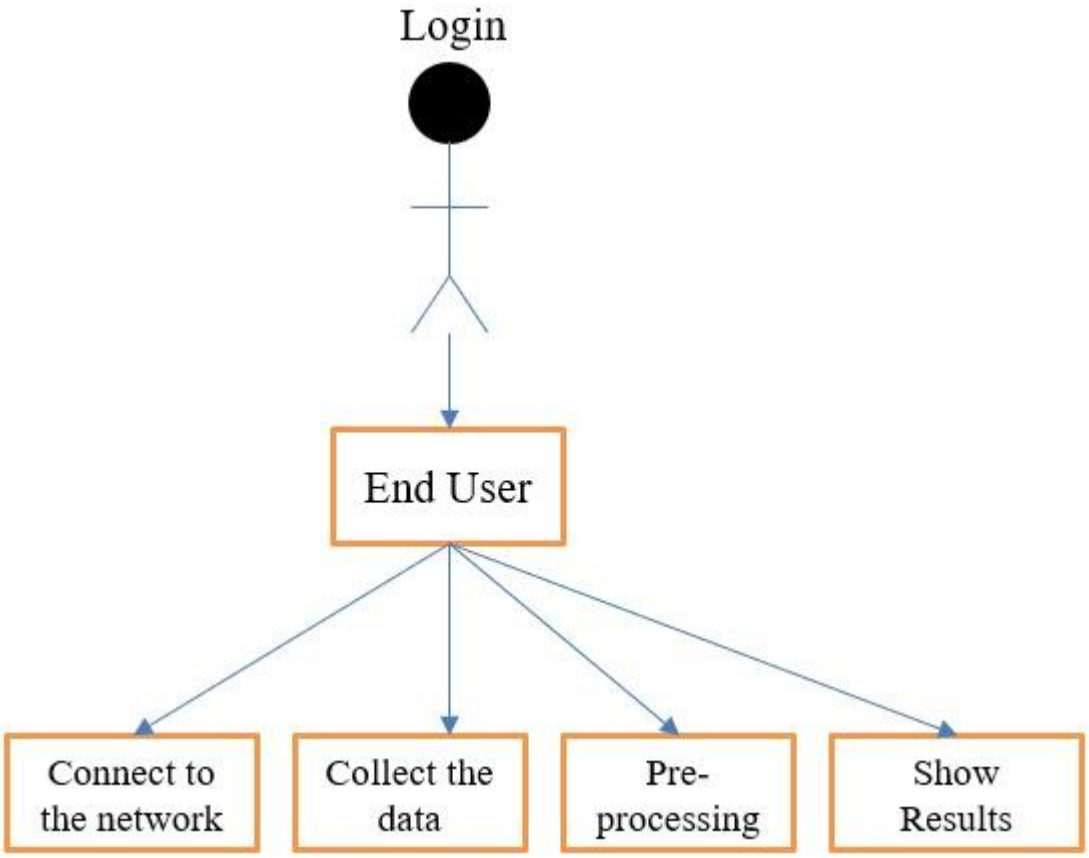


Fig. 3.3: Use case diagram

3.1.2 CLASS DIAGRAM:

Class diagram describes the attributes and operations of a category and conjointly the constraints obligatory on the system. The category diagrams are wide utilized in the modelling of object-oriented systems as a result of they're the sole UML diagrams, which may be mapped directly with object-oriented languages.

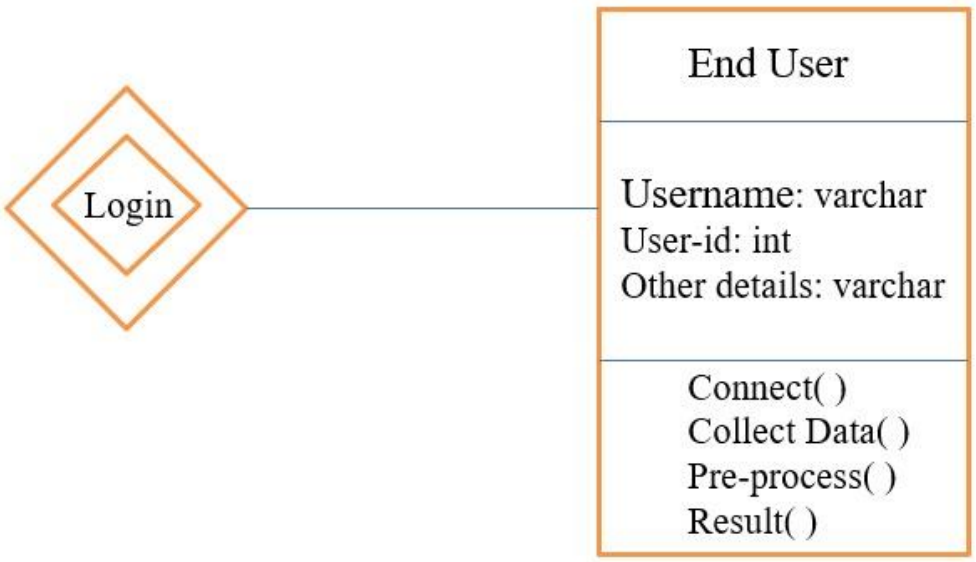


Fig.3.4: Class Diagram

3.1.3 COMPONENT DIAGRAM:

Component diagram may be a special reasonably diagram in UML. the aim is additionally totally different from all different diagrams mentioned thus far. It doesn't describe the practicality of the system however it describes the elements want to build those functionalities.

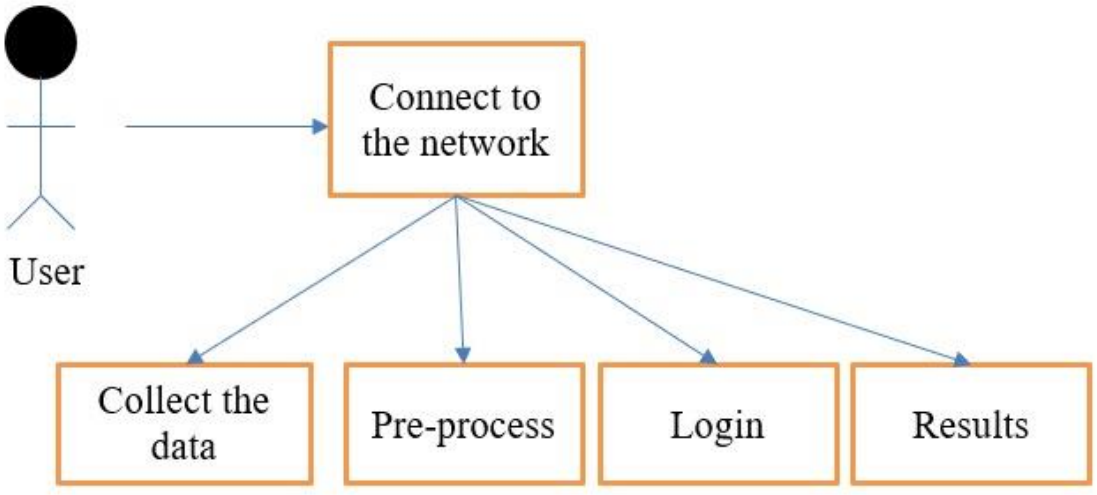


Fig.3.5: Component Diagram

CHAPTER 3

HARDWARE REQUIREMENTS AND DESCRIPTION

ARDUINO UNO:

The most common version of Arduino is that the Arduino Uno. This board is what most of the people unit of measure talking regarding once they sit down with laurels Arduino. The Uno is one in every of the additional fashionable boards at intervals the Arduino family and a good alternative for beginners. There unit of measure all fully totally different revisions of Arduino Uno, below detail is that the foremost up-to-date revision (Rev3 or R3).

The Arduino Uno could also be a microcontroller board supported the ATmega328. it's fourteen digital input/output pins (of that half-dozen is additionally used as PWM outputs), half-dozen analog inputs, a sixteen-rate ceramic resonator, a USB affiliation, Associate in Nursing influence jack, laurels ICSP header, and a push. It contains everything required to support the microcontroller; simply connect it to a laptop computer with a USB cable or power it with laurels AC-to-DC adapter or battery to urge started.

FEATURES

Microcontroller : ATmega328

Operating Voltage : 5V

Input Voltage (recommended) : 7-12V

Input Voltage (limits) : 6-20V

Digital I/O Pins : 14 (of which 6 provide PWM output)

Analog Input Pins : 6

DC Current per I/O Pin : 40 mA

DC Current for 3.3V Pin : 50 mA

Flash Memory : 32 KB (ATmega328) of which 0.5 KB used by bootloader

SRAM : 2 KB (ATmega328)

EEPROM : 1 KB (ATmega328)

Clock Speed : 16 MHz

Length : 68.6 mm

Width : 53.4 mm

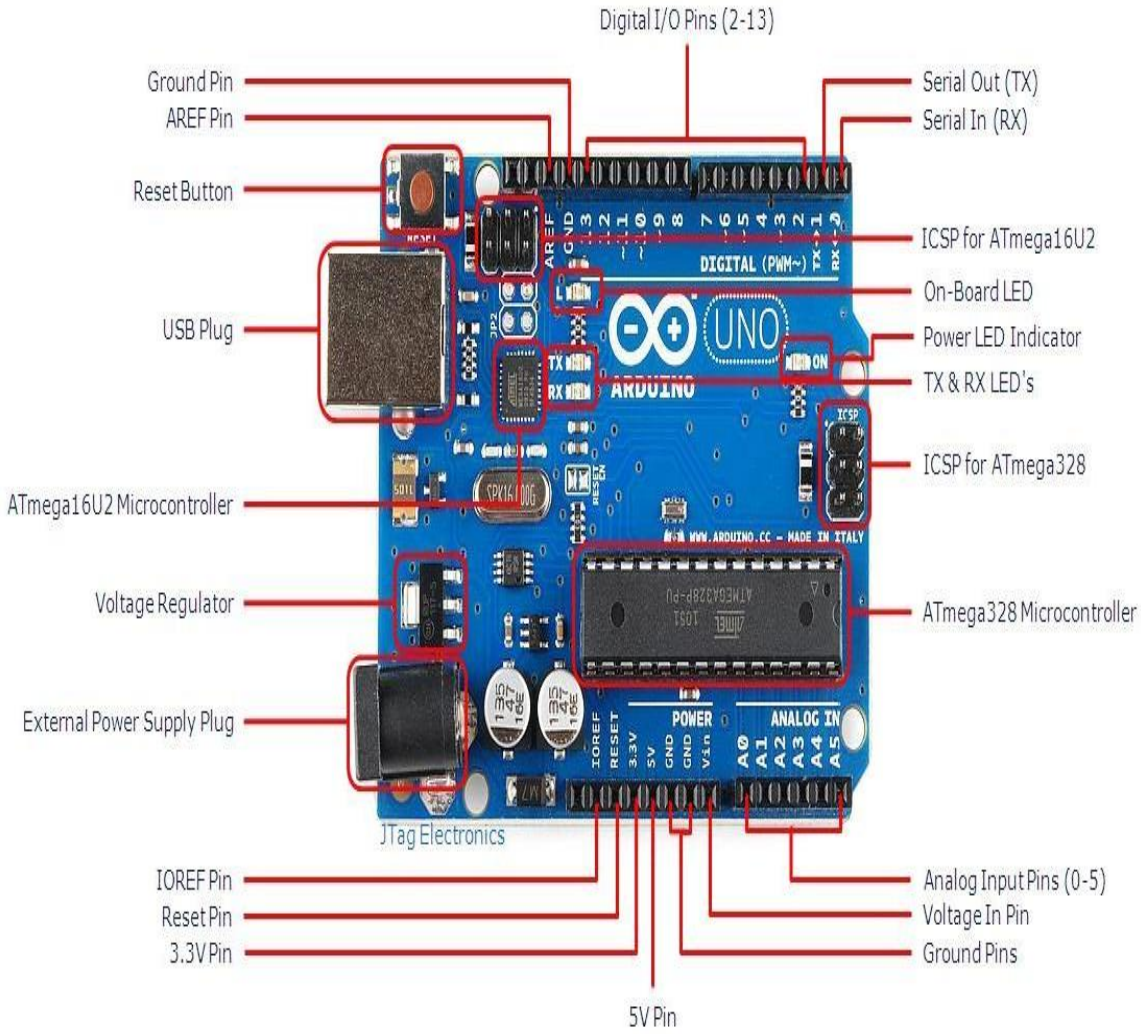


Fig 4.1: Arduino Uno Board

USB PLUG & EXTERNAL POWER SUPPLY PLUG

Every Arduino board wants how to be connected to an influence supply. The Arduino Uno may be battery-powered from a USB cable returning from your laptop or a wall power offer that's terminated during a barrel jack. the ability supply is chosen mechanically. The USB affiliation is additionally however you'll load code onto your Arduino board. The board will operate associate degree external offer of six to twenty volts. If equipped but 7V, however, the 5V pin could provide but 5 volts and also the board is also unstable. If victimization over 12V, the transformer might overheat and injury the board. The counseled vary is seven to twelve volts.

VOLTAGE REGULATOR

The electrical device is not one issue you will (or should) act with on the Arduino. but it's in all probability useful to know that it's there and what it's for. The electrical device can exactly what it says – it controls the amount of voltage that is let into the Arduino board. accept it as a style of gatekeeper; it's going to shrink back an extra voltage which can injury the circuit. Of course, it has its limits, therefore don't attach your Arduino to one thing larger than twenty volts.

POWER PINS

Voltage In Pin – The input voltage to the Arduino board once it's exploitation associate external power supply (as against five volts from the USB affiliation or alternative regulated power source). you'll be able to provide voltage through this pin, or, if provision voltage via the facility jack, access it through this pin.

5V Pin – This pin outputs a regulated 5V from the regulator on the board. The board will be furnished with power either from the DC power jack (7 – 12V), the USB connection (5V), or the VIN pin of the board (7-12V). provision voltage via the 5V or three.3V pins bypasses the regulator, and may injury your board. It's not suggested.3.3V Pin – A three.3 V provide generated by the on-board regulator. most current draw is fifty mA.

GROUND PINS

There are several GND pins on the Arduino, any of which can be used to ground your circuit.

IOREF PIN

This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

INPUT AND OUTPUT PINS

Each of the fourteen digital pins on the Uno is used as Associate in Nursing input or output. They operate at five volts. These pins are used for each digital input (like telling if a button is pushed) Associate in Nursing digital output (like powering an LED). every pin will offer

or receive a most of forty mA and has an interior pull-up resistance (disconnected by default) of 20-5k Ohms. additionally, some pins have specialized functions.

SERIAL OUT (TX) & SERIAL IN (RX)

Used to receive (RX) and transmit (TX) TTL serial information. These pins area unit connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

EXTERNAL INTERRUPTS

Pins attempt of Associate in Nursing three unit of measurement generally designed to trigger Associate in Nursing interrupt on associate degree occasional value, a rising or falling edge, or a modification in value.

PWM – you'll have detected the diacritic (~) next to create of the digital pins (3, 5, 6, 9, 10, and 11). These pins act as ancient digital pins, however can even be used for one issue declared as Pulse-Width Modulation (PWM). admit these pins as having the flexibleness to simulate Associate in Nursing a log output (like attenuation degree diode in and out).

SPI – Pins ten (SS), 11 (MOSI), 12 (MISO), 13 (SCK). SPI stands for Serial Peripheral Interface. These pins support SPI communication victimization the SPI library.

Analog Input Pins – labelled A0 through A5, every of that provide ten bits of resolution (i.e., 1024 fully all fully totally different values). These pins will browse the signal from Associate in Nursing analog device (like a temperature sensor) and convert it into a digital value that we tend to tend to tend to face live getting to browse. By default, they live from ground to five volts, although is it gettable to vary the higher finish of them vary victimization the AREF Pin (Stands for Analog Reference. Most of the time you may be able to leave this pin alone). to boot, some pins have specialized functionality:

TWI – Pins A4 or SDA pin and A5 or SCL pin. Support TWI communication victimization the Wire library.

RESET PIN

Bring this line LOW to reset the microcontroller. Generally, want to add a push button to shields that block the one on the board.

LED INDICATORS

Power junction rectifier Indicator – simply at a lower place and to the correct of the word "UNO" on your circuit card, there's a small junction rectifier next to the word 'ON'. This

junction rectifier ought to illumine whenever you plug your Arduino into an influence supply. If this light-weight doesn't activate, there's an honest likelihood one thing is wrong. Time to re-check your circuit!

On-Board junction rectifier – there's a inherent junction rectifier connected to digital pin thirteen. once the pin is HIGH price, the junction rectifier is on, once the pin is LOW, it's off. this convenient to quickly check if the board has no drawback as some boards includes a pre-loaded easy blinking junction rectifier program in it.

TX & RX LEDs – These LEDs can offer North American nation some nice visual indications once over our Arduino is receiving or transmittal information (like when we're loading a replacement program onto the board).

RESET BUTTON

Pushing the push button quickly connect the reset pin to ground and restart any code that's loaded on the Arduino. this could be terribly helpful if your code doesn't repeat, however you wish to check it multiple times.

WI –FI MODULE (ESP8266)

The ESP8266 could be a cheap wi-fi chip with full TCP/IP stack and MCU (Microcontoller Unit) capability made by Shanghai-based Chinese manufacturer. The chip initial came to the eye of western manufacturers in August 2014 with the ESP-01 module, created by a third-party manufacturer, AI-Thinker. This tiny module permits microcontrollers to attach to a Wi-Fi network and create straightforward TCP/IP connections mistreatment Hayes-style commands. However, at the time there was nearly no English-language documentation on the chip and therefore the commands it accepted. The terribly low worth and therefore the incontrovertible fact that there have been only a few external elements on the module that recommended that it might eventually be terribly cheap in volume, attracted several hackers to explore the module, chip, and therefore the computer code on that, further on translate the Chinese documentation.

The ESP8285 is associate ESP8266 with one MiB of constitutional flash, granting single-chip devices capable of connecting to Wi-Fi.

Features

- 32-bit RISC CPU : TensilicaXtensa L106 running at 80 MHz*
- 64 KiB of instruction RAM, 96 KiB of data RAM

- External QSPI flash: 512 KiB to 4 MiB* (up to 16 MiB is supported)
- IEEE 802.11 b/g/n Wi-Fi
- Integrated TR switch, balun, LNA, power amplifier and matching network
- WEP or WPA/WPA2 authentication, or open networks
- 16 GPIO pins
- SPI
- I²C
- I²S interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
- 10-bit ADC

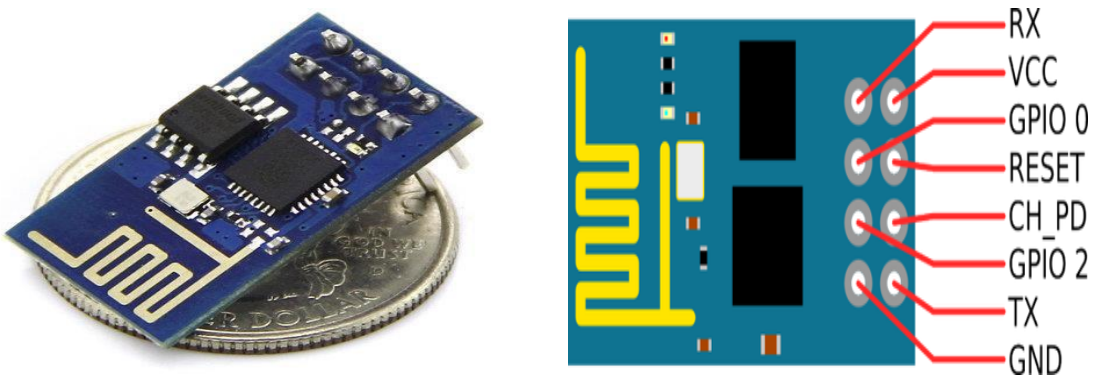


Fig 4.2: ESP8266 Wi-Fi Module

Temperature Sensor & Humidity Sensor

The temperature is about at a definite limit and therefore the temperature rises higher than the edge the microcontroller activates the fans to manage the temperature at intervals the nursery. The values of humidness detector will be viewed on the appliance. Here we've got used (Figure 7) temperature and humidness detector module that senses the temperature and humidness and sends the signal to the microcontroller.

Soil moisture sensor

The detector senses the wet level of the soil and once it goes below the edge the microcontroller sends the signal to the motor pump and water is dripped on to the roots of the plant through the drip irrigation system and once needed wet reached, the motor pump

is converted by the microcontroller mechanically. The detector utilized in our system is that the soil wet detector.

Light Sensor

During getting dark once the temperature falls below the brink, the sunshine detector sends the signal to the microcontroller and therefore the microcontroller successively, activates the sunshine furthermore because the heater to take care of the temperature within the nursery to some extent and therefore the temperature are often maintained. Here we've used INVNT_10Lm393 optical sensitive Ldr light-weight detector module having DC 5V This module is powerful for on-board process and storage capability that permits it to be integrated with the sensors and different application specific devices through its GPIOs with stripped-down development up-front and stripped-down loading throughout runtime. it's high degree of on-chip integration that permits for stripped-down external electronic equipment, as well as the front-end module, is intended to occupy stripped-down PCB space. The Wi-Fi module supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF permitting it to figure below all in operation conditions, and desires no external RF components.

4.2.1 TRANSFORMER

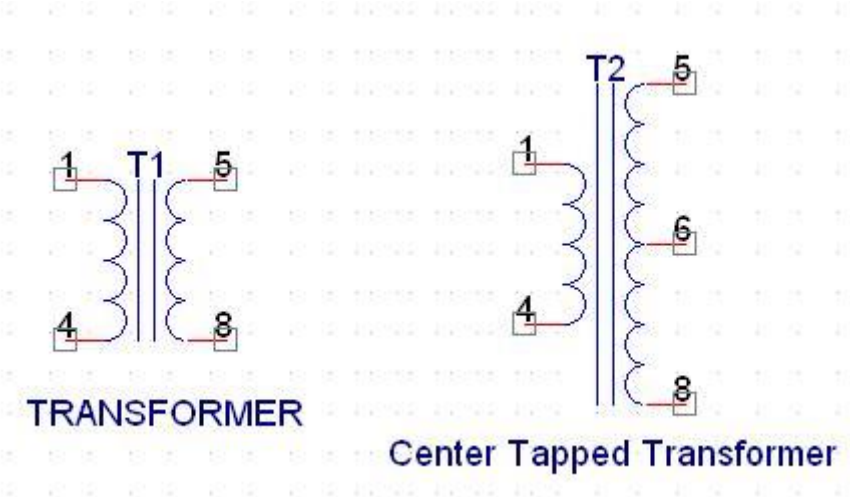


Fig 4.3: Types of transformer

An electrical device consists of 2 coils conjointly referred to as as “WINDINGS” specifically PRIMARY & SECONDARY.

They are connected along through inductively coupled electrical conductors conjointly referred to as CORE. An ever-changing current within the primary causes a modification within the magnetic flux within the core & this successively induces AN alternating voltage within the secondary winding. If load is applied to the secondary then AN electrical energy can flow through the load. If we have a tendency to think about a perfect condition then all the energy from the first circuit is going to be transferred to the secondary circuit through the magnetic flux.

$$P_{primary} = P_{secondary}$$

So

$$I_p V_p = I_s V_s$$

The secondary voltage of the transformer depends on the number of turns in the Primary as well as in the secondary.

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

4.2.2 Rectifier

A rectifier could be a device that converts AN AC signal into DC signal. For rectification purpose we tend to use a diode, a diode could be a device that permits current to pass solely in one direction i.e., once the anode of the diode is positive with relevancy the cathode conjointly known as forward biased condition & blocks current within the reversed biased condition.

Rectifier can be classified as follows:

1) Half Wave rectifier.

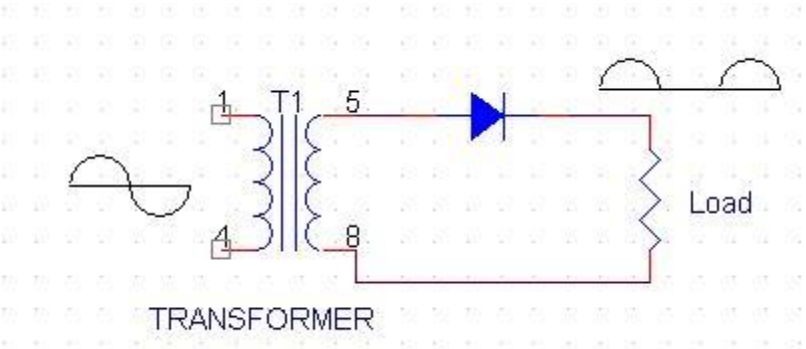


Fig 4.4: Half wave rectifier

This is the only sort of rectifier as you'll be able to see within the diagram a [*fr1] wave rectifier consists of just one diode. once associate degree AC signal is applied thereto throughout the positive [*fr1] cycle the diode is forward biased & current flows through it. However, throughout the negative [*fr1] cycle diode is reverse biased & no current flows through it. Since just one half the input reaches the output, it's terribly inefficient to be utilized in power provides.

2) Full wave rectifier.

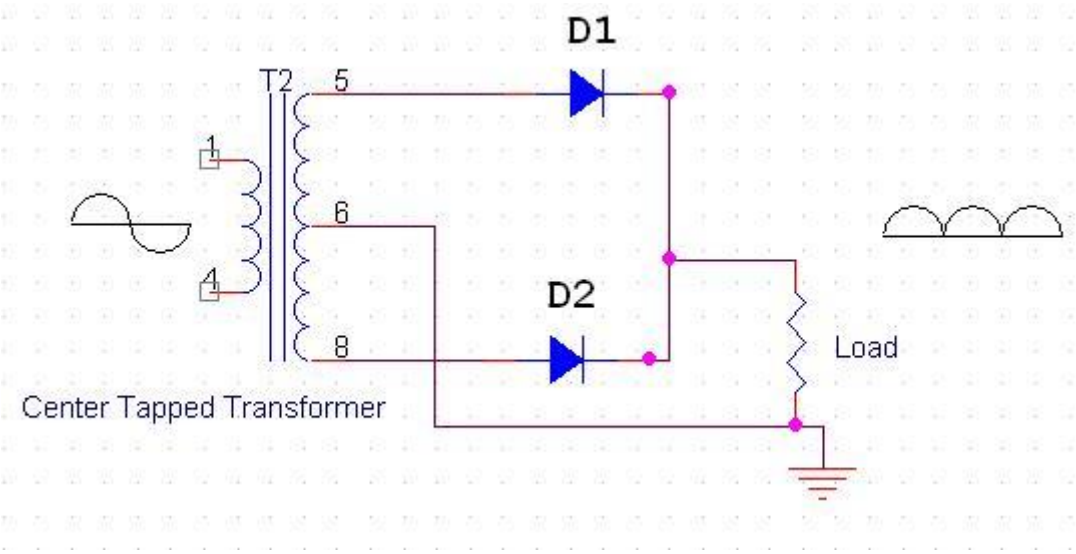


Fig 4.5: Full wave rectifier

Half wave rectifier is kind of straightforward however it's terribly inefficient, for larger potency we might wish to use each the 0.5 cycles of the AC signal. this may be achieved by employing a centre tapped electrical device i.e., we might ought to double the dimensions of coil & give association to the middle. Thus, throughout the positive 0.5 cycle diode D1 conducts & D2 is in reverse biased condition. throughout the negative 0.5 cycle diode D2 conducts & D1 is reverse biased. so we tend to get each the 0.5 cycles across the load. One of the disadvantages of Full Wave Rectifier style is that the necessity of employing a centre tapped electrical device, so increasing the dimensions & value of the circuit. this may be avoided by victimisation the complete Wave Bridge Rectifier.

3) Bridge Rectifier.

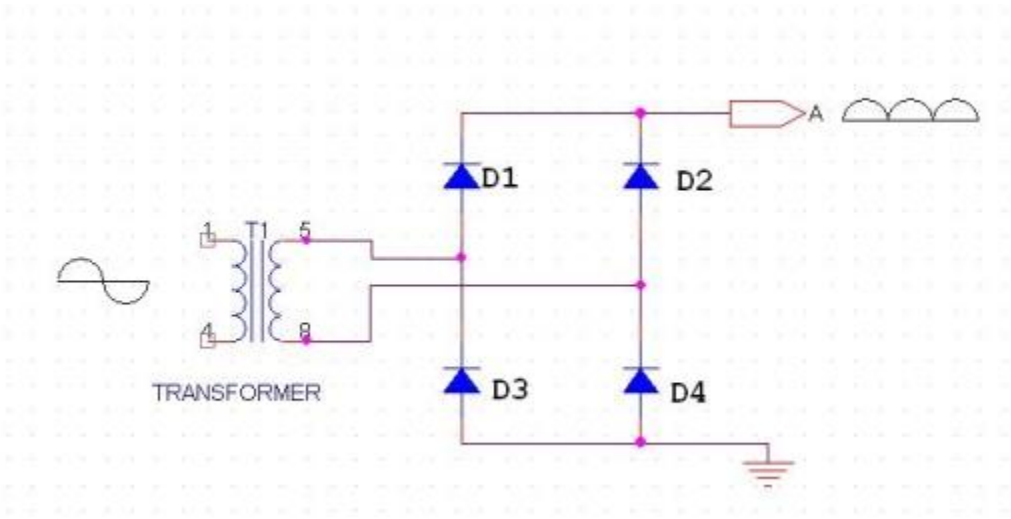


Fig 4.6: Bridge rectifier

As the name suggests it converts the total wave i.e. each the positive & the negative 0.5 cycle into DC therefore it's rather more economical than 0.5 Wave Rectifier & that too while not employing a centre abroach electrical device therefore rather more value effective than Full Wave Rectifier. Full Bridge Wave Rectifier consists of 4 diodes particularly D1, D2, D3 and D4. throughout the positive 0.5 cycle diodes D1 & D4 conduct whereas within the negative 0.5 cycle diodes D2 & D3 conduct therefore the diodes keep change the electrical device connections therefore we tend to get positive 0.5 cycles within the output.

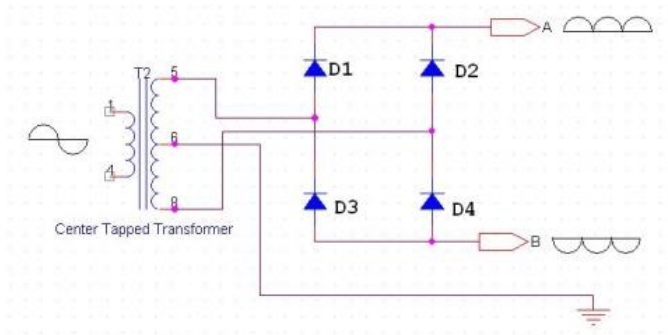


Fig 4.7: Bridge rectifier with centre tapped

If we tend to use a middle tapped electrical device for a bridge rectifier, we are able to get each positive & negative 0.5 cycles which may so be used for generating fastened positive & fastened negative voltages.

4.2.3 FILTER CAPACITOR

Even though 0.5 wave & full wave rectifier offer DC output, none of them provides a relentless output voltage. For this we tend to need to smoothen the undulation received from the rectifier. this could be done by employing a capacitance at the output of the rectifier this capacitance is additionally known as “FILTER CAPACITOR” or “SMOOTHING CAPACITOR” or “RESERVOIR CAPACITOR”. Even once victimisation this capacitance a tiny low quantity of ripple can stay. We place the Filter capacitance at the output of the rectifier the capacitance can charge to the height voltage throughout every 0.5 cycle then can discharge its keep energy slowly through the load whereas the corrected voltage drops to zero, so attempting to stay the voltage as constant as potential.

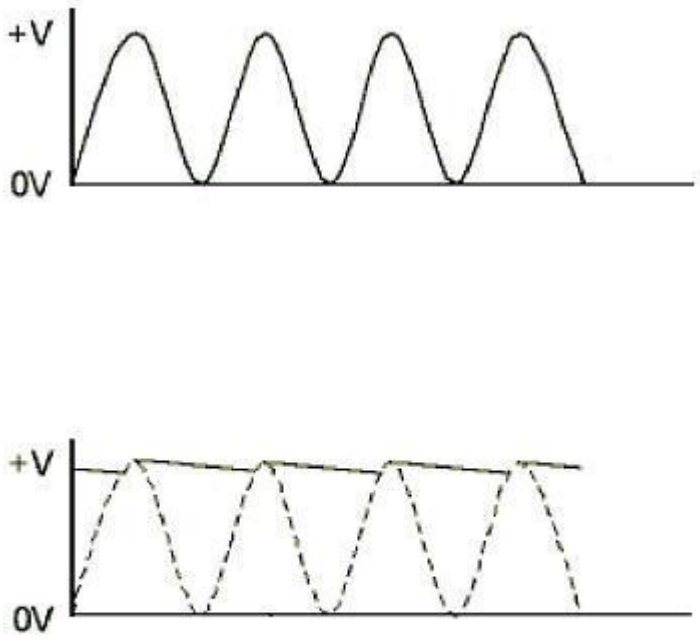


Fig:4.8 output waveforms

If we have a tendency to press on increasing the worth of the filter electrical device then the Ripple can decrease then again, the cost accounting can increase. The worth of the

Filter electrical device depends on the present consumed by the circuit, the frequency of the wave form & the accepted ripple.

$$C = \frac{V_r F}{I}$$

Where,

Vr = accepted ripple voltage. (should not be more than 10% of the voltage)

I= current consumed by the circuit in Amperes.

F= frequency of the waveform. A half wave rectifier has only one peak in one cycle so F=25hz

Whereas a full wave rectifier has Two peaks in one cycle so F=100hz

4.2.4 VOLTAGE REGULATOR

A device may even be a tool that converts varied input voltage into an unbroken regulated output voltage. device is of two varieties 1) Linear device on noted as Resistive device as a result of the dissipate the excessive voltage resistively as heat. 2) switch Regulators. They regulate the output voltage by switch this ON/OFF really quickly. Since their output is either ON or OFF it dissipates really low power so achieving higher efficiency as compared to linear voltage regulators. but they are additional advanced & generate high noise as a result of their switch action. For low level of output power switch regulators tend to be pricey apart from higher output power they are additional price effective than linear regulators. The most generally offered Linear Positive Voltage Regulators unit of activity the 78XX series where the XX indicates the output voltage

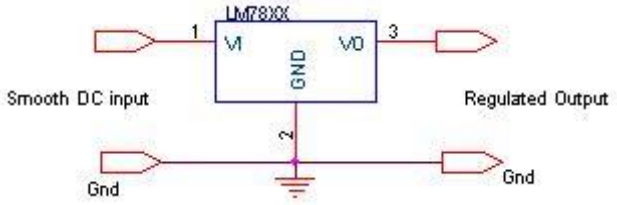


Fig: 4.9 Switching regulator

After filtering the rectifier output the signal is given to a voltage regulator. The maximum input voltage that can be applied at the input is 35V.Normally there is a 2-3 Volts drop

across the regulator so the input voltage should be at least 2-3 Volts higher than the output voltage. If the input voltage gets below the Vmin of the regulator due to the ripple voltage or due to any other reason the voltage regulator will not be able to produce the correct regulated voltage.

Circuit Diagram:

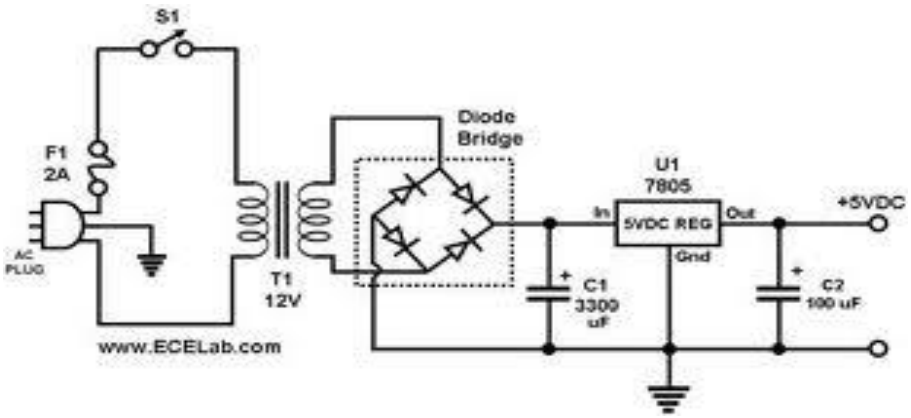


Fig: 4.10 Circuit Diagram of power supply

IC 7805:

7805 is Associate in Nursing integrated three-terminal positive fastened linear transformer. It supports Associate in Nursing input voltage of ten volts to thirty-five volts and output voltage of five volts. it's a current rating of one amp though lower current models are out there. Its output voltage is fastened at five.0V. The 7805 conjointly incorporates an inherent current clipper as a security feature. 7805 is factory-made by several firms, together with National Semiconductors and Fairchild Semiconductors.

The 7805 can mechanically cut back output current if it gets too hot. The last 2 digits represent the voltage; for example, the 7812 may be a 12-volt regulator. The 78xx series of regulators is meant to figure in complement with the 79xx series of negative voltage regulators in systems that give each positive and negative regulated voltages, since the 78xx series cannot regulate negative voltages in such a system. The seventy eight05 & 78 is one in all the foremost common and well-known of the 78xx series regulators, as its tiny element count and medium-power regulated 5V build it helpful for powering TTL devices

SPECIFICATIONS	IC 7805
V_{out}	5V
V_{ein} - V_{out} Difference	5V - 20V
Operation Ambient Temp	0 - 125°C
Output I_{max}	1A

Table 4.1. Specifications of IC7805

LCD (LIQUID CRYSTAL DISPLAY)

LCD (Liquid Crystal Display) Shown in fig. is Associate in Nursing electronic show module. A 16x2 {lcd|liquid crystal show|LCD|digital display|alphanumeric display} display is extremely basic module and is extremely normally utilized in differing kinds of devices and circuits. These modules are most well-liked over seven section and different multi section LEDs.

Fig 4.11: 16x2 LCD

A sixteenx2 liquid LCD alphanumeric display} suggests that it display sixteen characters per line and their square measure 2 lines. By this alphanumeric display each character is displayed in 5x7 picture element matrix. This alphanumeric display contains a pair of registers, that square measure Command and knowledge. The command register stores the command directions that's given to the alphanumeric display. A command is Associate in Nursing instruction that's given to alphanumeric display to do and do a predefined task like initializing it, clearing its screen, setting the pointer position, dominant show etc. the knowledge register stores the knowledge to be displayed on the alphanumeric display. the knowledge is among the fashion of code price of the character to be displayed on the alphanumeric display. the foremost normally used Character primarily based LCDs square

measure supported Hitachi's HD44780 controller or completely different that square measure compatible with HD44580.

A sixteenx2 liquid LCD alphanumeric display} suggests that it'll display sixteen characters per line and their square measure 2 such lines. throughout this alphanumeric display each character is displayed in 5x7 picture element matrix. This alphanumeric display has a pair of registers, namely, Command and knowledge. The command register stores the command directions given to the alphanumeric display. A command is Associate in Nursing instruction given to alphanumeric display to do and do a predefined task like initializing it, clearing its screen, setting the pointer position, dominant show etc. the knowledge register stores the knowledge to be displayed on the alphanumeric display. the knowledge is that the code price of the character to be displayed on the alphanumeric display.

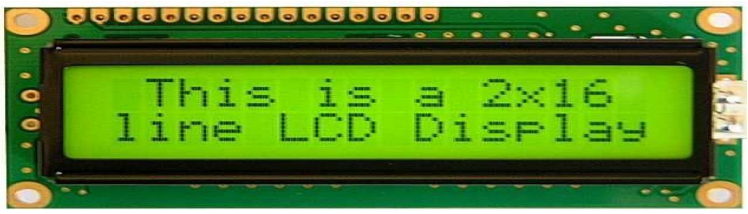


Fig 4.12: 16x2 LCD display

PIN DESCRIPTION OF LCD

Most LCDs with one controller have fourteen Pins and LCDs with a pair of controller has sixteen Pins (two pins square measure additional in each for back-light junction rectifier connections). Pin description is shown within the table below:

Pin Number	Symbol	Function
1	Vss	Ground Terminal
2	Vcc	Positive Supply
3	Vdd	Contrast adjustment
4	RS	Register Select; 0→Instruction Register, 1→Data Register
5	R/W	Read/write Signal; 1→Read, 0→ Write
6	E	Enable; Falling edge
7	DB0	Bi-directional data bus, data transfer is performed once, thru DB0 to DB7, in the case of interface data length is 8-bits; and twice, through DB4 to DB7 in the case of interface data length is 4-bits. Upper four bits first then lower four bits.
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	LED-(K)	Back light LED cathode terminal
16	LED+(A)	Back Light LED anode terminal

Table 4.2: Pin configuration table for a 16x2 lcd character display

DATA/SIGNALS/EXECUTION OF LCD

LCD accepts 2 styles of signals, one is knowledge, and another is management. These signals square measure recognized by the LCD module from standing of the RS pin. Currently knowledge may be browsed additionally from the liquid crystal {display|LCD|digital display|alphanumeric display} display, by propulsion the R/W pin

high. As before long because the E pin is periodical, liquid crystal {display|LCD|digital display|alphanumeric display} display reads knowledge at the falling fringe of the heartbeat and executes it, same for the case of transmission.

LCD show takes a time of 39-43µS to put a personality or execute a command. Apart from clearing show and to hunt pointer to home position it takes one.53ms to 1.64ms. Any conceive to send any knowledge before this interval could result in failure to browse knowledge or execution of the present knowledge in some devices. Some devices compensate the speed by storing the incoming knowledge to some temporary registers.

COMMANDS AND INSTRUCTION SET

Only the instruction registers (IR) and also the knowledge register (DR) of the liquid crystal display will be controlled by the MCU. Before beginning the interior operation of the liquid crystal display, management data is briefly kept into these registers to permit interfacing with varied MCUs, that operate at totally different speeds, or varied peripheral management devices. the interior operation of the liquid crystal display is decided by signals sent from the MCU. These signals, that embrace register choice signal (RS), read/write signal (R/W), and also the knowledge bus (DB0 to DB7), frame the liquid crystal display directions.

There are four categories of instructions that:

- Designate LCD functions, such as display format, data length, etc.
- Set internal RAM addresses
- Perform data transfer with internal RAM
- Perform miscellaneous functions

Although observing the table you'll be able to create your own commands and check them. Below may be a temporary list of helpful commands that ar used oft whereas performing on the digital display.

Command	Code										Description	Execution Time
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears the display and returns the cursor to the home position (address 0).	82μs~1.64ms
Return Home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position (address 0). Also returns a shifted display to the home position. DD RAM contents remain unchanged.	40μs~1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and enables/disables the display.	40μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Turns the display ON/OFF (D), or the cursor ON/OFF (C), and blink of the character at the cursor position (B).	40μs
Cursor & Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing the DD RAM contents.	40μs
Function Set	0	0	0	0	1	DL	N$	F	*	#	Sets the data width (DL), the number of lines in the display (L), and the character font (F).	40μs
Set CG RAM Address	0	0	0	1	A_{CG}						Sets the CG RAM address. CG RAM data can be read or altered after making this setting.	40μs
Set DD RAM Address	0	0	1	A_{DD}							Sets the DD RAM address. Data may be written or read after making this setting.	40μs
Read Busy Flag & Address	0	1	BF	AC							Reads the BUSY flag (BF) indicating that an internal operation is being performed and reads the address counter contents.	1μs
Write Data to CG or DD RAM	1	0	Write Data								Writes data into DD RAM or CG RAM.	46μs
Read Data from CG or DD RAM	1	1	Read Data								Reads data from DD RAM or CG RAM.	46μs
	I/D = 1: Increment I/D = 0: Decrement S = 1: Accompanies display shift. S/C= 1: Display shift S/C = 0: cursor move R/L= 1: Shift to the right. R/L= 0: Shift to the left. DL = 1: 8 bits DL = 0: 4 bits N = 1: 2 lines N = 0: 1 line F = 1: 5x10 dots F = 0: 5 x 7 dots BF = 1: Busy BF = 0: Can accept data *# Set to 1 on 24x4 modules* *$ With KS0072 is Address Mode.*										DD RAM: Display data RAM CG RAM: Character generator RAM A_{CG}: CG RAM Address A_{DD}: DD RAM Address Corresponds to cursor address. AC: Address counter Used for both DD and CG RAM address.	Execution times are typical. If transfers are timed by software and the busy flag is not used, add 10% to the above times.

Table 4.3: Showing various LCD Command Description

S.NO	Command	HEX	DEC
1	Function Set: 8-bit, 1 Line, 5x7 Dots	0x30	48
2	Function Set: 8-bit, 2 Line, 5x7 Dots	0x38	56
3	Function Set: 4-bit, 1 Line, 5x7 Dots	0x20	32
4	Function Set: 4-bit, 2 Line, 5x7 Dots	0x28	40
5	Entry Mode	0x06	6
6	Display off Cursor off (clearing display without clearing DDRAM content)	0x08	8
7	Display on Cursor on	0x0E	14
8	Display on Cursor off	0x0C	12
9	Display on Cursor blinking	0x0F	15
10	Shift entire display left	0x18	24
12	Shift entire display right	0x1C	30
13	Move cursor left by one character	0x10	16
14	Move cursor right by one character	0x14	20

15	Clear Display (also clear DDRAM content)	0x01	1
16	Set DDRAM address position on display	0x80+add*	128+add*
17	Set CGRAM address or set pointer to CGRAM location	0x40+add**	64+add**

Table 4.4: Frequently Used Commands and Instructions for LCD

LIQUID CRYSTAL DISPLAYS INTERFACING WITH CONTROLLER

The LCD standard requires 3 control lines and 8 I/O lines for the data bus.

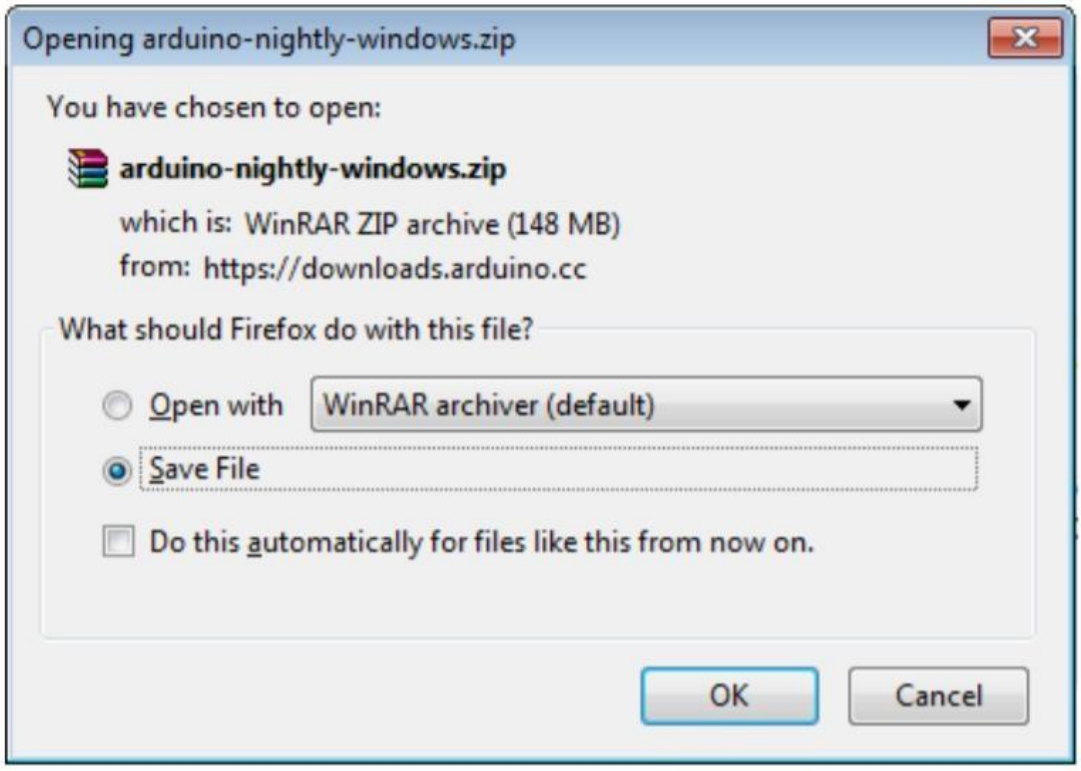
Fig:4.13: LCD interfacing with controller

CHAPTER 4

SOFTWARE DESCRIPTION AND IMPLEMENTATION

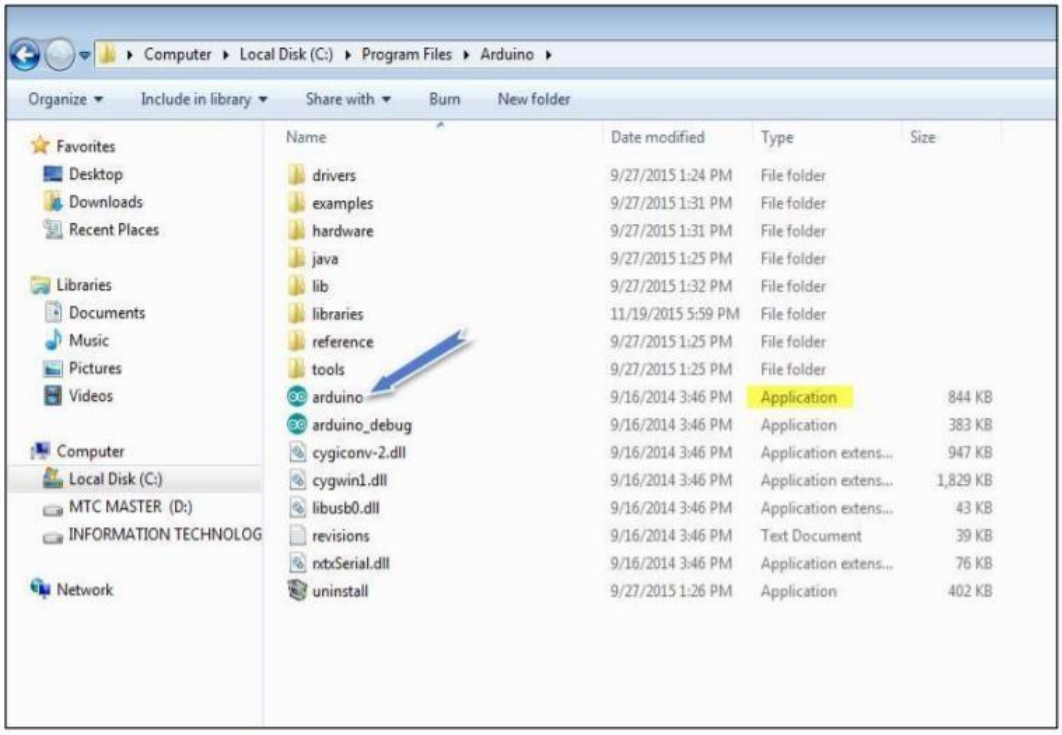
4.1 SOFTWARE INTRODUCTION:

Arduino IDE computer code. you'll get totally different versions of Arduino IDE from the transfer page on the Arduino Official web site. you need to choose your computer code, that is compatible together with your software system (Windows, IOS, or Linux). when your file transfer is complete, unfasten the file.



Screenshot 5.1

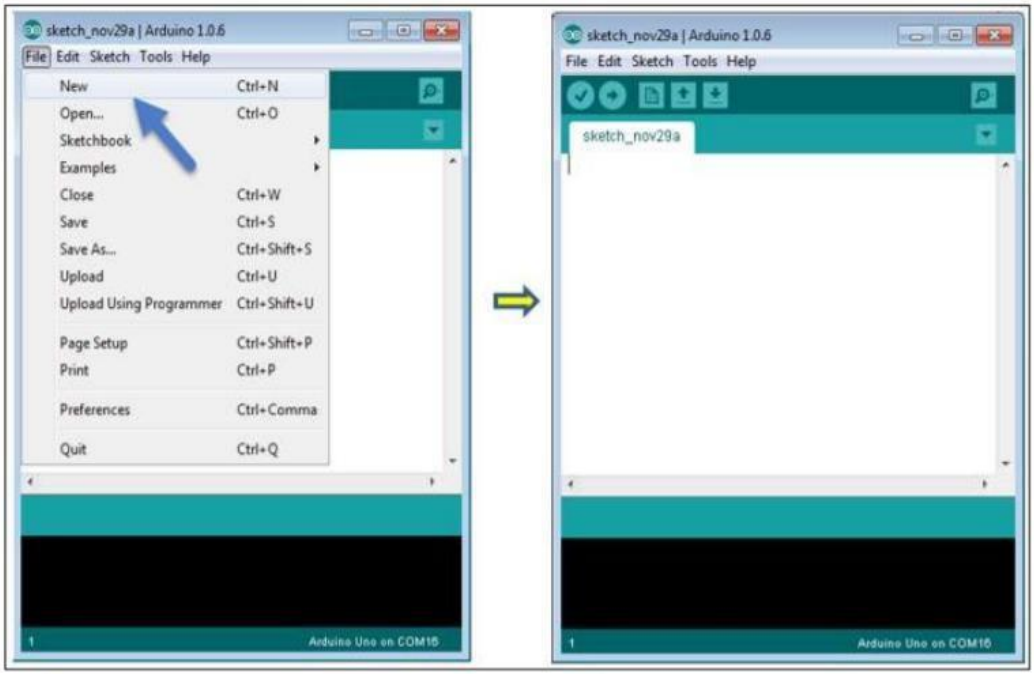
Launch Arduino IDE. once your Arduino IDE software package is downloaded, you want to unfasten the folder. inside the folder, you will be ready to notice the applying icon with degree eternity label (application.exe). Double click the icon to begin out the IDE.



Screenshot 5.2

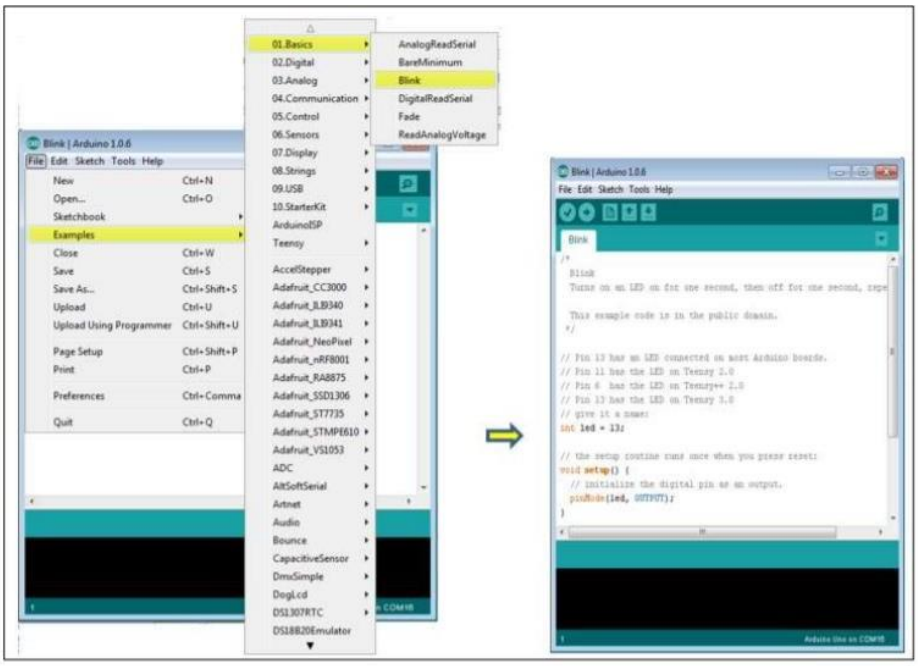
Open your first project. Once the software starts, you have two options:

Create a new project.

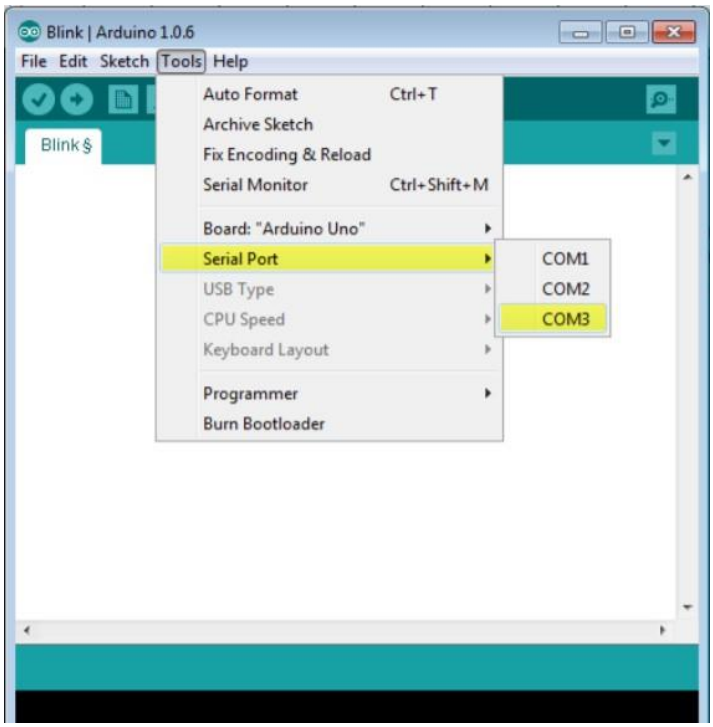


Screenshot 5.3

Open an existing project example. To create a new project, select File --> New



Screenshot 5.4



Screenshot 5.5

Here, we tend are choosing only one of the examples with the name Blink. It turns the junction rectifier on and off with a while delay. you'll be able to choose the other example from the list. choose your interface. choose the serial device of the Arduino board. head to Tools-> interface menu. this is often probably to be COM3 or higher (COM1 and COM2 ar sometimes reserved for hardware serial ports). to seek out, you'll be able to disconnect your Arduino board and re-open the menu, the entry that disappears ought to be of the Arduino board. Reconnect the board and choose that interface.

Before explaining however we are able to transfer our program to the board, we have a tendency to should demonstrate the operate of every image showing within the Arduino IDE toolbar.

Used to check if there's any compilation error.

Used to transfer a program to the Arduino board.

Shortcut used to create a new sketch.

Used to directly open one of the examples

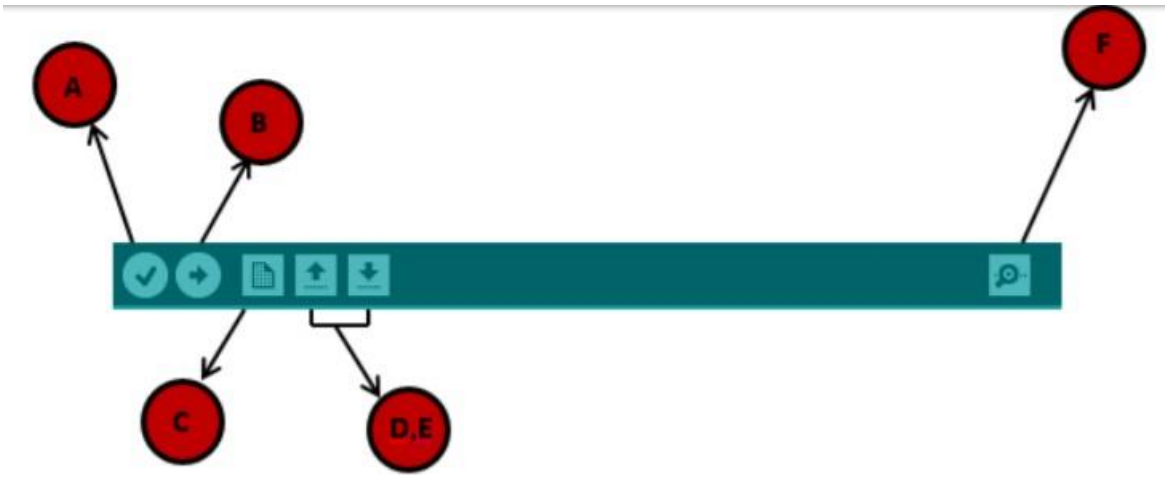
sketches.

E- Used to save your sketch.

F- Serial monitor want to receive serial knowledge from the board and send the serial knowledge to the board.

Now, simply click the "Upload" button in the environment.

Wait some seconds; you may see the RX and TX LEDs on the board, flashing. If the transfer is palmy, the message "Done uploading" can seem within the standing bar.

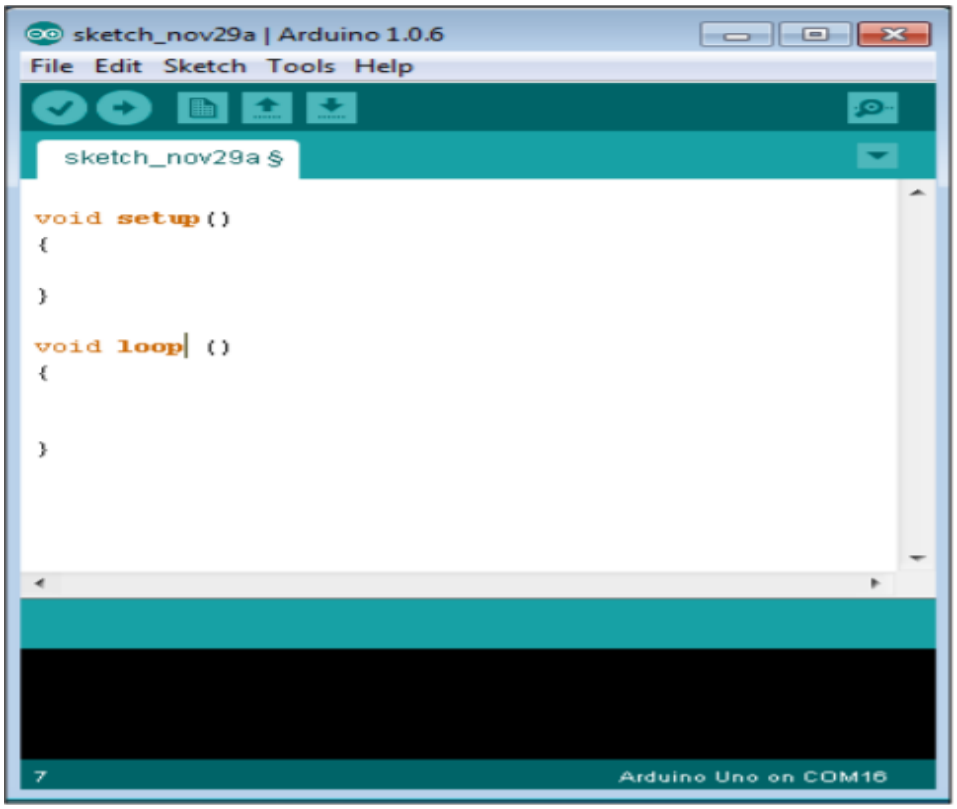


Screenshot 5.6

In this chapter, we are going to study thorough, the Arduino program structure and that we can learn additional new terminologies employed in the Arduino world. The Arduino software system is ASCII text file. The ASCII text file for the Java atmosphere is discharged beneath the GPL and also the C/C++ microcontroller libraries area unit beneath the LGPL. Sketch: the primary new word is that the Arduino program referred to as "sketch". Structure Arduino programs will be divided in 3 main parts: Structure, Values (variables and constants), and Functions. during this tutorial, we are going to study the Arduino software system program, step by step, and the way we are able to write the program with none syntax or compilation error. allow us to begin with the Structure. software system structure encompasses 2 main functions:

Setup () function

Loop () function



Screenshot 5.7

Data varieties in C refers to an intensive system used for declaring variables or functions of various varieties. the sort of a variable determines what proportion house it occupies within the storage and the way the bit pattern hold on is taken. the subsequent table provides all the information varieties that you simply can use throughout Arduino programming.

5.2 INTERNET OF THINGS

The Internet of Things (IoT) is additionally a system of meshed computing devices, mechanical and digital machines, objects, animals or people who unit of activity given distinctive identifiers and so the flexibleness to transfer data over a network whereas not requiring human-to-human or human to computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electro mechanical systems (MEMS), small services and so Infobahn. The convergence has helped level the silo walls between operational technology (OT) and knowledge technology (IT), permitting unstructured machine - generated data to be analyzed for insights which can drive enhancements.

5.3 ARDUINO SOFTWARE

In order to connect associate object to the IoT, several things unit of measurement needed inside the hardware and code realm. 1st of all, if one needs to travel on the so much aspect simply connecting info from a portable computer, objects to gather (sensors) or receive (actuators) this case, the data should be uploaded to a network of connected servers that run applications. Such a network is usually determined as 'the cloud'. The cloud utilizes the strategy of visual image, which suggests that several physical servers square measure typically connected and utilized in wheel, but appear to the user conjointly machine (despite that at the physical level, the machines operate independently). This method of computing therefore permits changes to be created to the 'virtual' server (such as code updates or changes in storage space) teeming easier than before. throughout this case, associate object will connect with the cloud through a (possibly wireless) web association to transfer or receive info. Objects to be connected unit of measurement usually inflated with either sensors or actuators. A detector square measure some things that tells USA regarding the atmosphere. contemplate a temperature detector, or maybe the GPS receiver on your transportable. Actuators unit of measurement one issue simply} just want to manage. Things like thermostats, lights, pumps, and shops. The IoT brings everything on and permits USA to maneuver with our things and, even plenty of curiously, permits things to maneuver with various things. For the aim of connecting associate object to the IoT, we've got an inclination to concentrate on the problem scan Free. {this is|this is typically|this will be} often be} in addition on the market as associate application where the user can transfer it and examine the results. The interface provides easy communication capabilities to things within the IoT surroundings, additionally as fascinating more applications (such as issue Tweet, which may be extra mentioned in an exceedingly} very later section). Moreover, issue scan Free permits you to form applications around info collected by sensors. It offers getting ready to fundamental measure info assortment, processing, and in addition easy visualizations for its users. info is hold on in questionable channels, that has the user with a list of choices. each channel permits you to store up to eight fields of knowledge, depletion to 255 alphanumeric characters each. There square measure four dedicated fields for purpose info, consisting of: Description, Latitude, Longitude, and Elevation. All incoming info is time and date sealed and receives a ordered

ID. Once a channel has been created, info square measure typically unconcealed by accessing the problem scan Free API with a ‘write key’, a every which way created distinctive alphanumeric string used for authentication. Consequently, a ‘read key’ is utilized to access channel info simply just in case it's set to remain its info private (the default setting). Channels could also be created public throughout that case no scan key's required. in line with the problem scan Free information processing system, the API works as noted in Figure one. primarily, ‘things’ unit of measurement objects that unit of measurement given sensors to assemble info. info is distributed and received via easy “Hypertext Transfer Protocol” (HTTP) POSTs, terribly almost like going to a web page and filling out a sort. This communication happens through plaintext, JSON or XML. the data is then uploaded to the cloud and from there square measure typically used for a variety of functions. In turn, info (such as commands or choosing certain options) square measure typically gathered and communicated to the cloud, that in turn sends these messages to the item. A deeper level of what happens, notably on the server side, square measure typically seen in Figure 2 [15]. once a tool sends info through a machine-readable text transfer protocol request (communication), it's processed by the IoT service (in this case Thing Speak), that communicates with a virtual server. The server and additionally the IoT service communicate directly with the appliance. Finally, in any respect levels of communication from the device to the appliance there is everything about security and management of the data transfer. sadly, Thing View Free does not document but the precise components of the diagram unit of measurement handled on a technical level. Given enough time and skill, it got to however be potential to answer this by attempting into the (open source) code base. For this report, we've got an inclination to require the instance of connecting a push (herein determined as a result of the ‘tweeting push’) to the Thing View Free web service which may send a message to Twitter whenever the push button was rung. The association from Thing View free to Twitter is handled by the appliance 'Thing Tweet', a script freelances from the Thing View Free API but, on the market, once mistreatment the API from the Thing View Free web service. Messages from Thing View Free unit of measurement communicated to Twitter via associate machine-readable text transfer protocol POST. This feature actually permits users to bypass displaying info in an exceedingly} very channel and directly transfer.

4.4 CODE:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(6,7,5,4,3,2);
#include <SoftwareSerial.h>
SoftwareSerial mySerial(A4,A5);
#include <Wire.h>
#include "dht.h"
char res[130];
int relay  = 9;
int buzzer = 13;
#define dht_apin 8
dht DHT;
int tempc=0,humc=0,ldrc=0;
char moss[5]="No_Rain\0";
char ldrs[8]="Light\0";
void serialFlush()
{
  while(Serial.available() > 0)
  {
    char t = Serial.read();
  }
}

void myserialFlush()
{
  while(mySerial.available() > 0)
  {
    char t = mySerial.read();
  }
}
char check(char* ex,int timeout)
```

```
{
  int i=0;
  int j = 0,k=0;
  while (1)
  {
    sl:
    if(mySerial.available() > 0)
    {
      res[i] = mySerial.read();
      if(res[i] == 0x0a || res[i]=='>' || i == 100)
      {
        i++;
        res[i] = 0;break;
      }
      i++;
    }
    j++;
    if(j == 30000)
    {
      k++;
     // Serial.println("kk");
      j = 0;
    }
    if(k > timeout)
    {
      //Serial.println("timeout");
      return 1;
     }
  }//while 1
  if(!strncmp(ex,res,strlen(ex)))
  {
```

```
   // Serial.println("ok..");
    return 0;
   }
  else
  {
   // Serial.print("Wrong  ");
   // Serial.println(res);
    i=0;
    goto sl;
   }
}
char buff[200],k=0;
void upload(unsigned int s1,unsigned int s2,unsigned int s3);
char readserver(void);
void clearserver(void);
const char* ssid = "iotserver";
const char* password = "iotserver123";

void beep()
{
 digitalWrite(buzzer, LOW);delay(2000);digitalWrite(buzzer, HIGH);delay(500);
}
void setup()
{
  char ret;
  pinMode(buzzer,OUTPUT);
  pinMode(relay,OUTPUT);
  digitalWrite(buzzer,HIGH);
  digitalWrite(relay,LOW);
  Serial.begin(9600);
  mySerial.begin(9600);
  lcd.begin(16,2);
```

```
  lcd.setCursor(0, 0);lcd.print("Nurse Automation");
     delay(2500);
   wifiinit();
  delay(2500);
  lcd.clear();
  lcd.print("T:");//2-3-4,0
  lcd.setCursor(8,0);
  lcd.print("H:");//10,0
}
char bf3[50];
int g=0,f=0,count=0,lc=0;
int gk=0;
void loop()
{
 char ctrl=0;
    DHT.read11(dht_apin);
    tempc = DHT.temperature;
    humc  = DHT.humidity;
    lcd.setCursor(2,0);convertl(tempc);
    lcd.setCursor(10,0);convertl(humc);
    if(tempc >= 35)
      {
        digitalWrite(relay, HIGH);
        beep();
         lcd.setCursor(14,1);lcd.print("U ");
             upload(tempc,humc);
         lcd.setCursor(14,1);lcd.print("  ");
      }
    else
      {
        digitalWrite(relay, LOW);
```

```
      }
      delay(1000);
      count++;
      lcd.setCursor(14,1);convertk(count);
      if(count > 30)
        {
         count = 0;
         lcd.setCursor(14,1);lcd.print("U ");
             upload(tempc,humc);
         lcd.setCursor(14,1);lcd.print("  ");
        }
      ctrl=0;
}
char bf2[70];
void upload(unsigned int s1,unsigned int s2)
{
  delay(2000);
  lcd.setCursor(14, 1);lcd.print("U");
  myserialFlush();
  mySerial.println("AT+CIPSTART=4,\"TCP\",\"projectsfactoryserver.in\",80");
  //http://projectsfactoryserver.in/storedata.php?name=pf5&s1=25&s2=35
  //sprintf(buff,"GET
http://embeddedspot.top/iot/storedata.php?name=iot139&s1=%u&s2=%u&s3=%u\r\n\r\n",s1,s2);
      delay(8000);
     /*
      if(s1 == 1){sprintf(buff,"GET
http://projectsfactoryserver.in/storedata.php?name=iot1&s1=ON\r\n\r\n");}
      if(s1 == 2){sprintf(buff,"GET
http://projectsfactoryserver.in/storedata.php?name=iot1&s1=OFF\r\n\r\n");}
      if(s1 == 3){sprintf(buff,"GET
http://projectsfactoryserver.in/storedata.php?name=iot1&s2=Wet\r\n\r\n");}
      if(s1 == 4){sprintf(buff,"GET
http://projectsfactoryserver.in/storedata.php?name=iot1&s2=Dry\r\n\r\n");}
```

```
    */
     memset(buff,0,strlen(buff));
     sprintf(buff,"GET
http://projectsfactoryserver.in/storedata.php?name=server126&s1=%u&s2=%u\r\n\r\n",s1,s2);
//     buff = buff + moss + "\r\n\r\n";
    // strcat(buff,s3);
     myserialFlush();
     sprintf(bf2,"AT+CIPSEND=4,%u",strlen(buff));
     mySerial.println(bf2);
       delay(5000);
        myserialFlush();
        mySerial.print(buff);
           delay(2000);
           mySerial.println("AT+CIPCLOSE");
     lcd.setCursor(14, 1);lcd.print(" ");
}
```

4.5 IMPLEMENTATION AND ADVANTAGES

The proposed design is fully automated and everything is controlled by the microcontroller. It reduces the use of the labor resource and only needs proper supervision to make sure that everything is going on smoothly. As the govt of India is providing sufficient loans for the development of farmers and the rural and urban society through various schemes so, money won't be much barrier in the construction process of the same. Also, the profit obtained will be much more than expected, so

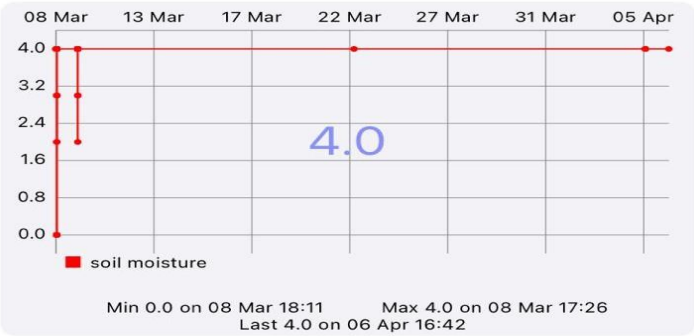
the farmers can easily repay the loans as early as possible once after the yielding starts. Implementing the above technology and cultivation of different plants will improve the quality of living of the farmers as well as the society of India.

CHAPTER 5

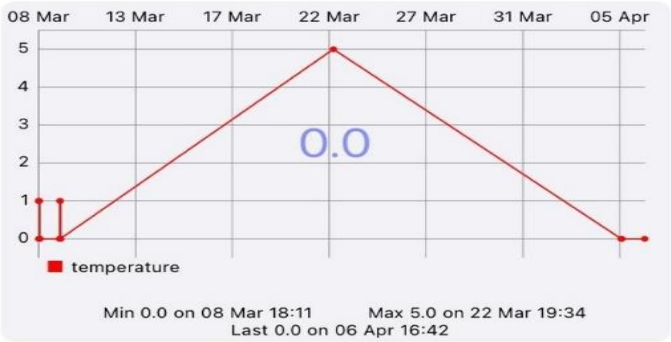
RESULT

Sample Input Data

The data or the results can be viewed either Thing View Free application or website. The data is in graphically viewed where the date and time can also be seen on the application as well as the website. As the values of the sensors changes when they are activated, the data will also be changed including the time and date. This helps a user to understand at what time the values have been changed.



Screenshot 6.1 Soil Moisture



Screenshot 6.2 Temperature

Screenshot 6.3 Humidity

CHAPTER 6
CONCLUSION

CONCLUSION:

This methodology is implemented using IoT with Arduino which reduces the cost and also makes easier to set the system. The graphical data helps to monitor the real-time data and also automation is done through Arduino which gives the date and time securing the data where the other person cannot view without the credentials. Using the website and also the application creates an easy task to a user in order to view the results predicted by the sensors used.

FUTURE SCOPE:

The present system focuses on the temperature and also the soil moisture which are monitored by the Arduino. Later, sprinklers and GSM modules can be implemented to this system to make it more precise.

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